Keep an Eye on the Future:
Powering Decisions Today Need to Consider Tomorrow's Developments
By Rick Marcotte

The CATV market, in existence for more than 45 years, continues to grow despite the fact that almost 95% of U.S. households are now "passed" by at least one cable provider. The momentum behind cable growth is not so much due to increased population and new housing developments, but technological developments that allow services beyond basic video to be transmitted over broadband networks. With new service offerings, cable operators must take into account how future services will impact their current powering architecture.

For example, the back-up power requirements for telephony over cable will stretch the need for standby power anywhere from four to eight hours. In order to provide back-up power for extended periods of time an alternate power source must be used, most commonly a generator. Lifeline support, like 911 telephone service, is a 24 hour-a-day requirement. Therefore, the cable system must be capable of operating through a power outage that lasts for a prolonged period. Acceptable network downtime can be no more than 53 minutes per year, or 99.99% uptime, the same as is provided by today's local exchange telephone carriers.

The expansion of information services on a broadband network requires a new breed of active components plus a dramatic increase in overall network reliability. Powering requirements will go beyond the capabilities of traditional CATV powering architectures, creating "unknowns." These unknowns could be related to network powered devices, such as network-interface units (NIU), ringing voltages over coax for telephone service, energy management controllers or a host of other possible scenarios. In addition, the existing interaction of constant power coax signal amplifiers, regardless of the length of the cascade, will increase the dynamic power demands on the network power supplies. These new, and in some cases, unknown dynamic network powering demands will occur in both distributed and centralized power architectures alike. In the absence of knowing what future dynamic loads will be, it's important that operators look ahead and plan for them now. Engineers need to spec, design and build a more robust power supply to enhance overload capabilities. The power supply has to have the intelligence to allow you to use that overload capability only when you need it. This allows the network to handle peak power draws from dynamic loads that could be of short duration, without dropping the load or turning off the power supply. The power supply must also prevent the possibility of damaging the downstream network components. When temporary overloads or short circuits occur, the inherent capabilities of a traditional CATV ferroresonant transformer limits the amount of current that is delivered. However, if a "smart" transformer is used, the power supply can handle larger short-term overloads without causing damage to the network passive/active components or to the power supply itself.

Some new models of ferroresonant transformers are capable of handling overloads up to 200 percent, which is usually adequate to clear a short duration network fault. When used in conjunction with a digital microprocessor, advanced microprocessor control algorithms act like a finger on a switch, turning the ferroresonant transformer off in an overload situation based on pre-defined criteria. This "turn-off" command would act like a "virtual fuse" to provide protection to the network components and to the power supply itself. Ideally, overloads of 200 percent for greater than one second would "blow the fuse" and turn off the power supply, saving the active components and power supply itself. Fuses are known to be excellent protection devices, but are difficult to replace. In an overload situation, the virtual fuse would blow (i.e. the microprocessor has turned off the power to the network). In order to make the virtual fuse truly maintenance free, the microprocessor would have to turn the power supply back on and monitor the output current. If the output current overload has ended, the power supply would remain on (i.e. "replace" the fuse). If the overload still existed, the virtual fuse would blow again and the process would be repeated. This scenario is the best of both worlds - an extra strength ferroresonant transformer with advanced controls to harness its power.

A major advantage of using a microprocessor in this type of power supply design is that it allows for the configuration or adaptation of the power characteristics to correspond with changes in the loads. The "maintenance-free virtual fuse" trip curve can be pre-defined in the microprocessor software code to deliver the optimal output current for the optimal amount of time. Operating parameters can be configured through software code. The use of a microprocessor also reduces parts count in the power supply and allows cost-effective integration of a digital liquid crystal display, giving the ability for high resolution digital metering with true root mean square (RMS) measurement. Another benefit of the microprocessor is the built-in capability to deliver digital signaling for tomorrow's status monitoring requirements, via RS232 or some other interface, once the network status monitoring systems migrate toward full digital end-to-end signaling.

Even though widespread offering of new cable services, such as Internet access and telephony, are still a few years away, operators must prepare today. Choosing a powering architecture that is flexible and upgradeable will help make the transition to future services cost-effective. Don't strand your investment by using power supplies and protection equipment that can't function in tomorrow's networks.